

## Unit D: Exploring Our Universe



## Chapter 9 – Celestial Objects, phenomena, and interactions are important to people in many different ways

### Outcomes

- Examine how various cultures, past and present, including First Nations and Métis, understand and represent astronomical phenomena.
- Inquire into the motion and characteristics of astronomical bodies in our solar system and the universe
- Analyze scientific explanations of the formation and evolution of our solar system and universe

Thursday, January 03, 2013

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### 9.1 Human Interest in Space

- Early cultures and civilizations studied celestial patterns with their unaided eye and used their observations to develop calendars, plan hunting and farming activities, navigate across land and oceans, and inspire spiritual beliefs and rituals

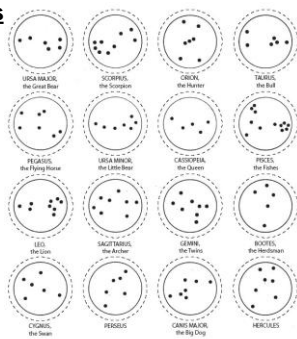
- Astronomy is making sense of the universe that lies beyond earth
  - The universe is everything that exists, including all matter and energy everywhere.
  - Earth is located in the universe. The study of the universe beyond earth is called astronomy

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### Star Constellations

- Groups of stars that seem to form shapes or patterns are called constellations



- Technologies, such as the Kamal, the quadrant, and the sextant, were developed to facilitate sea travel
  - The quadrant (picture) and the sextant measured the angle between the horizon and a celestial body



- The position of celestial bodies can be determined using azimuth and altitude and declination and right ascension
  - Azimuth position from due north (degrees)
  - Altitude measure from the horizon (degrees)
  - Right ascension (longitude hours)
  - Declination (latitude hours)

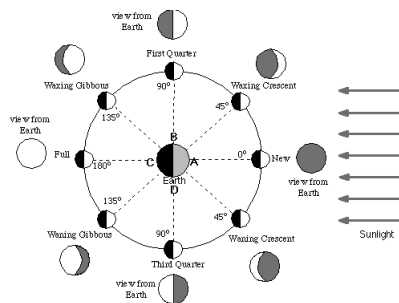
Read p. 305 – 310

Check and Reflect 9.1 # 1 – 11 (p. 310)

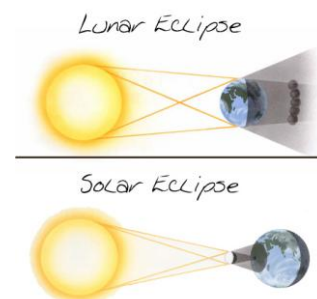
## 9.2 Earth, Moon, and Sun Relationships

- First nations and Métis understandings explain astronomical phenomena, such as changing seasons, eclipses, and auroras

- The movement of celestial bodies in our solar system, including Earth, creates observable patterns, such as Moon phases, and phenomena, such as eclipses

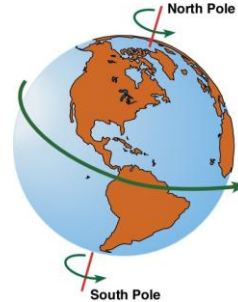


The Sun-Moon angle is the angle defined by Sun→Earth→Moon with Earth (where source) as the angle vertex. As the Sun-Moon angle increases we see more of the sunlit part of the Moon. Note that if this drawing were to scale, then the Moon would be half this size and its orbit would be about 22 times larger in diameter and the Sun would be about 369 times further away than the Moon!



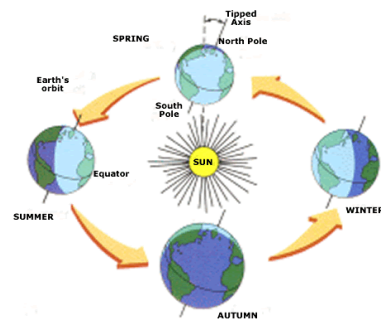
### Effects of Earth's Rotation

- Stars like the sun seem to rise in the east and set in the west. This is called the Earth's motion.
- One type of motion is called rotation, which is the spinning of an object around its axis. One rotation of the earth takes 24 hours.
- Earth's axis is an imaginary line from the North to South Pole through the earth.

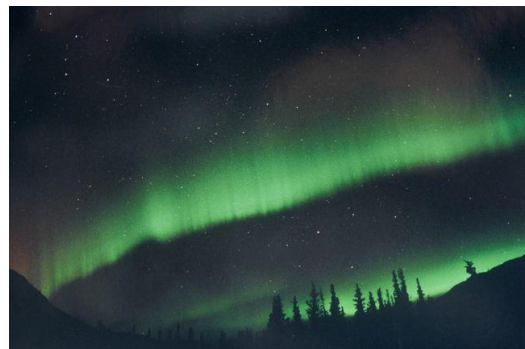


### Effects of Earth's Revolution

- Another type of motion is revolution, which is the movement of an object around another. One revolution of the Earth around the sun takes one year (365.26 days).
- Combined with the tilt on the earth's axis its revolution is the reason for the change of seasons.
- The Earth's revolution allows us to see different stars during different seasons.



- The Sun's magnetic field affects the Earth by not only creating auroras at both poles, but may also interfere with or damage equipment.
- The aurora borealis, or North Lights, is understood by First Nations and Métis peoples as a powerful phenomenon.

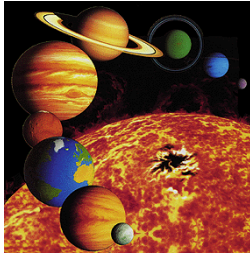


Read p. 314 – 325

Learning Checkpoint p. 317 # 1 – 2

Check and Reflect 9.2 # 1 – 16 (p. 325)

- The rocky planets in the inner solar system are Mercury, Venus, Earth, and Mars. The gaseous planets in the outer solar system are Jupiter, Saturn, Uranus, and Neptune.



- Planets and Moons are nonluminous they do not emit their own light we see them in the sky only because the light from the sun reflecting off of them.



### 9.3 Our Solar System

- Our solar system is composed of the Sun, planets, their moons, and other objects such as asteroids and comets. Nebular theory suggests that our solar system formed from the left over gas, dust, and other debris spinning around a newly formed Sun

#### Objects in the Solar System

- The solar system consists of our sun and all the objects that travel around it, including nine planets and the moons that travel some of the planets.

Sun → Mercury → Venus → Earth → Mars →  
Jupiter → Saturn → Uranus → Neptune

- Everything in our solar system is much closer than the stars and other objects in the universe.

#### Observing Stars and Planets

- A star is matter that emits huge amounts of energy.
- A planet is matter, generally spherical, that revolves around a star.
- Only five planets are visible with the unaided eye: Venus, Mars, Jupiter, Saturn, and Mercury.

**Comparing Stars and Planets**

Feature	Planet	Star
Location	in the solar system	far beyond solar system
distance from Earth	relatively near	very far
real size	smaller than most stars	usually larger than planets
reason we see it	reflects light	emits light
surface temperature	cool to very cold	very hot

Feature	Planet	Star
object is composed of	rocks or gases	gases under high temperature and pressure
observable feature	does not 'twinkle'	appears to 'twinkle'
long term observable feature	very slowly wanders through constellations	moves through the sky as part of a constellation

- First nations and Métis understandings explain the origin of Earth and our solar system, and astronomical phenomena, such as meteors
  - Asteroid – metallic/rocky bodies that orbit the sun
  - Dwarf Planet – unusual orbit that contain other objects
  - Comet – ice and dust with an elliptical orbit
  - Meteoroid – metal/rock that travels in space
  - Meteor - meteoroid that burns in the atmosphere
  - Meteorite – meteoroid that strikes earth

- Distances in space are measured in astronomical units (AU) and light-years (ly)
- 1 AU = 150 000 000 km
- Speed of light = 300 000 km / s

Inquiry Activity D9 – Calculating Astronomical Distances

Table 9.2 Q # 6 - 9

Read p. 328 – 340

Learning Checkpoint p. 333 # 1 – 2

Check and Reflect 9.3 # 1 – 13 (p. 340)

Chapter 9 Review

P. 346 – 347 # 1 – 32

**Chapter 10 - Stars are an important component of galaxies****Outcomes**

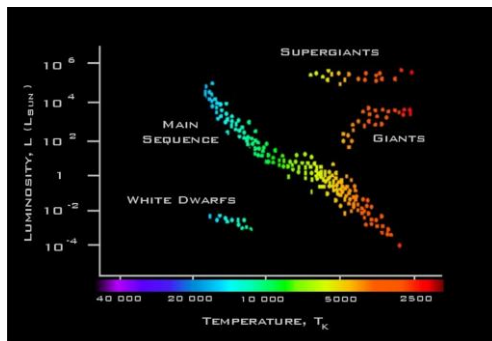
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## 10.1 Stars

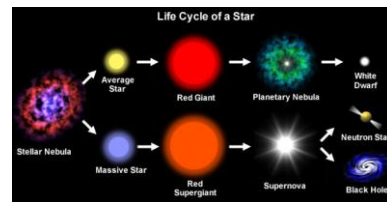
- First nations and Métis understandings explain the origin of the universe astronomical phenomena, such as the Milky Way and supernovas

- A star forms inside a nebula as gravitational forces pull dust and gas together, creating a spinning, contracting disk of material in which nuclear fission begins. Stars are classified according to their colour, luminosity, and temperature

The Hertzsprung-Russel Diagram



- Stars have life cycles during which they form and then evolve in one of three main ways



Read p. 349 – 358

Learning Checkpoint p. 354 # 1 – 2

Check and Reflect 10.1 # 1 – 12 (p. 358)

## 10.2 Galaxies

- Galaxies, which have four types of shapes, contain about 200 billion stars each and usually have a super massive black hole in the center
  - Spiral
  - Barred Spiral
  - Elliptical
  - Irregular

- Galaxies contain star clusters and black holes
  - A star cluster is a concentration of stars in a relatively small region of space
  - A black hole is a region of space where gravitational forces are so strong that nothing, not even light, can escape

- Quasars, which are the brightest objects in the universe, are created by energy being fed into black holes



- Dark matter makes up 90% of matter in the universe
  - Dark matter refers to matter in the universe that is invisible because it does not interact with light or any kind of radiation

Read p. 361 – 367

Check and Reflect 10.2 # 1 – 10 (p. 367)

Chapter Review

P. 370 – 371 # 1 – 34